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ABSTRACT

Fifty-two institutionalized mentally handicapped children (average CA of 12 years) were engaged in a study attempting to determine whether there are ordinal dependencies in various scales of developmental milestones or supra-structural behaviors in language, and if so, the degree to which hierarchical levels within given categories serve as functional prerequisites to later levels in the same category. A shadow or blackout method was used in which Ss' language disorders were evaluated in terms of degree of co-absence of various linguistic milestones below their baseline level of development, while other types of paralled behavior were found to be present. The language behaviors considered were those which comprise the first 20 items on the Utah Test of Language Development. Data indicated that the invariable co-absences found should not be attributed completely to chance factory, but should be considered due either to hierarchical dependencies or nosological dependencies. (GW)

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A PRELIMINARY STUDY OF THE HIERARCHICAL DEPENDENCIES OF FUNCTIONAL LANGUAGE MILESTONES

by

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Background

The existing developmental scales of language ability contain items which are presumed to be mastered by the majority of children at given ages as determined by cross sectional "normative" samples at various age levels. A child's position relative to his peer group is determined by summating his successes on the assumption that level of language development reflects an additive accumulation of various behaviors. However, a score on such a test, tells little about the relative influence of various items on each other or whether development of certain behaviors listed on a scale is in any way prerequisite to development of any of the behaviors listed later up the developmental ladder. Although not now available, such information would be invaluable to us in terms of guiding children through proper prerequisite or readiness experiences.

Structural analyses have been made in language which have identified general laws or universal tendencies in the areas of phonology, syntax, and to some extent, in semantics. It has been well established that milestones of functional language behaviors, that is, behavioral units which synthesize phonology, semantics and syntax for functional or social communicative purposes have a regular and universal ordinal dimension, i.e., their time of emergence is set in a rather fixed order maturationally (Lenneberg, 1967). However, we have no exact

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knowledge about any other kinds of relationships which exist among the various functional or "supra-structural" language behaviors. We do not know whether such laws of dependency exist, for example, wherein the existence of "x" always implies the present or prior existence of the entity "y" in the same system. Systematic taxonomies of this sort have been observed on a less molar level of communication development.

Piaget (1936, 1937, 1945) conceived of intellectual development as a synthesis of steps or stages which fall into a functional hierarchy. Jakobson (1971), the linguist, has postulated some hierarchical requisites in phonological development in language. Lenneberg (1967) has accumulated an impressive body of evidence supporting the idea that "perceived patters [of language] and the self-produced patterns of movements [in language] become organized or grouped in functional categories, and hierarchies of categories" (p. 325).

The Problem

The problem being considered in the present research project was to try to determine whether there are, in fact, ordinal dependencies in various scales of developmental milestones or supra-structural behaviors in language, and if so, the degree to which hierarchical levels within given categories serve as functional prerequisites to later levels in the same category.

Method

One method of categorizing various phenomena is to assume that those elements having some common feature or some systematic difference can be considered systematically related in some way. Another

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method which has been used in learning experiments is to arrange elements hierarchically according to some sort of organizational rules and observe improved efficiency with which the elements can be learned. One problem with attempts to arrange developmental behaviors hierarchically is that the behaviors emerge at different points in time and often some of the earlier behaviors disappear or are "masked" as later behaviors develop. Therefore, the elements of behaviors which emerge at different times cannot easily be manipulated and compared simultaneously.

The exploratory method which the present study used was a non-numerical nominal hierarchical analysis, using a 'shadow' or 'black-out' method in which children with language disorders were studied in terms of degree of co-absence of various language milestones, below their baseline level of language development, while other types of parallel behaviors were found to be present.

If certain milestones are invariably co-absent, one could postulate that either the earlier member in the co-absent pair is prerequisite to the appearance of the later member of the pair, or that the two are nosological in origin, i.e., are both dependent upon common factors.

Subjects

Fifty-two institutionalized mentally-retarded children were used in the present study, 28 males and 26 females. Average CA of the group was 12.91 years, and the average mental age was 4.32 years; average language age was 3.31 years.* The rationale for using mentally-retarded children is the existence of substantial evidence that

*I would like to acknowledge with appreciation the Utah State Training School for its contribution to the study in allowing me to use subjects who are residents of that school.

"scattering" of pluses on developmental scales, especially language scales, is greater among this group than in various other etiological groups (Meehan, 1962; Barko, 1955). It was felt that these subjects would more likely have a "scattering" of early and late milestones in language and therefore co-absence or shadowing patterns could more easily be noted.

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Results

Table 1 shows the frequency of co-absence of the various pairs of functional language milestones which were assessed. As can be seen on this table, a number of items on the abscissa are found to be invariably or (100%) co-absent with earlier items located along the ordinate. Some of these co-absences form into chain sequences in which absence of earlier items in the chain seem to be invariably followed by the absence of the later items in the chain.

The language behaviors considered in this study were comprised of the first twenty items on the Utah Test of Language Development (UTLD). Absence of any of these items for any given subject was considered to be data if it occurred as a 'scatter' absence, that is, occurred below the ceiling score of the subject on the test.* Absences above the ceiling score of any subject were not considered in the analysis since they were thought to be 'latent' rather than 'abnormally absent.' The reasoning behind such selective inclusion was that 'scatter' absences can more logically be considered to be artifact phenomena since they always fall below the maturational level of the child.

Table 2 itemizes the clusters of language behaviors which were invariably co-absent. The first chain of invariable co-absences included items 2, 4, 7, and 16. Other clusters shown on Table 2 include items 8, 11, 16, and 19; items 5, 6, 8, and 11; items 7, 9, 10, and 19; and items 7, 9, 10, and 13.

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*Ceiling score is considered to be the highest item passed on the test.

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There are certain precautions which we need to mention in considering the validity of these data:

1. In measuring performance directly in an institutionalized mentally-retarded subject, an absence score may have been the result of unwillingness on the part of the child to perform rather than an absence of the behavior in the child's repertoire.

2. Inherent in the decision-making process regarding the adequacy or inadequacy of a behavior in the child's repertoire, is the fact that a small but specific number of judgments will be in error, i.e., the clinician will judge the child's behavior as adequate when it is in fact inadequate, or will judge the child's behavior as inadequate when it is in fact adequate (such error of decision making would be likely to have more influence in a small sampling than it would be in a larger sample).

Nevertheless, in looking at the items described in the clusters in Table 2, there seems to be a logical relationship between members of the clusters in general, and this logical relationship tends to lend support to the hypothesis that the invariable co-absences found in the present study should not be attributed completely to chance factors. The co-absences may be due to either heirarchical dependencies (i.e., some behaviors being prerequisite to the emergence of other later behaviors), or nosological dependencies (i.e., various behaviors within a cluster being dependent upon common determining factors rather

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them upon each other). Under the non-numerical nominal analysis used in the present study, we can only speculate that the clusters arrived at are true dependency clusters. No confidence levels could be established. However, it is the feeling of the present investigator that this type of data using a larger and more heterogeneous sample should lend itself to a more rigorous and decisive type of analysis (such as is found in some current computer programs designed to determine hierarchical clusters, or in some sort of numerical taxonomy analysis).

Additional research with a larger sample of language-disordered children from various parts of the country is presently being undertaken. The results of this larger sampling should provide additional insight into possible hierarchical dependencies of ordinal language behaviors as they unfold in young children.

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Table 1

Percentage of time that the abscissa item was absent whenever the ordinate item was absent

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1		0	0	1	1	1	2	3	0	2	*	0	3	3	1	7	1	2	10	0
2		100	66	100	100	100	100	100	100	100	100	0	*	*	*	*	*	*	*	*
3			100	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4				100	80	60	100	100	50	66	100	33	50	100	50	100	100	100	100	0
5					100	100	50	100	33	50	100	50	100	100	0	*	*	*	*	*
6						100	25	100	33	50	100	50	100	100	100	100	0	100	100	0
7							100	60	100	100	71	29	100	80	100	100	50	100	100	0
8								100	38	83	100	9	37	63	57	100	83	83	100	20
9									100	100	86	14	100	100	75	100	33	100	100	33
10										100	71	0	100	100	90	100	70	100	100	16
11											100	19	54	75	60	100	60	71	100	16
12												100	100	75	75	100	0	50	100	0
13													100	64	80	92	31	64	86	16
14														100	66	93	20	33	53	0
15															100	88	38	70	78	13
16																100	35	56	100	14
17																	100	88	100	13
18																		100	100	11
19																			100	10
20																				100

*These items had 100% coabsences, but the higher member of the pair was above the ceiling score of the child in each instance and was therefore considered 'latent' rather than 'absent.'

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Table 7

Five clusters or chains of items invariably 'co-[illegible]'

I	2 - Follows simple directions
	4 - Recognizes names of common objects
	7 - Identifies common pictures when named
	16 - Can repeat three digits
II	8 - Word combinations of two or more
	11 - Can repeat two digits
	16 - Can repeat three digits
	19 - Says at least one nursery rhyme
III	5 - Recognizes parts of the body when named
	6 - Recognizes parts of the body (greater number)
	8 - Word combinations of two or more
	11 - Can repeat two digits
IV	7 - Identifies common pictures when named
	9 - Names common pictures
	10 - Names common pictures (greater number)
	19 - Says at least one nursery rhyme
V	7 - Identifies common pictures when named
	9 - Names common pictures
	10 - Names common pictures (greater number)
	13 - Identifies actions in pictures